Geomorphology G322

Class Exercise on Landscape Erosion Rates Using the Baker Creek Landslide Geometry Data

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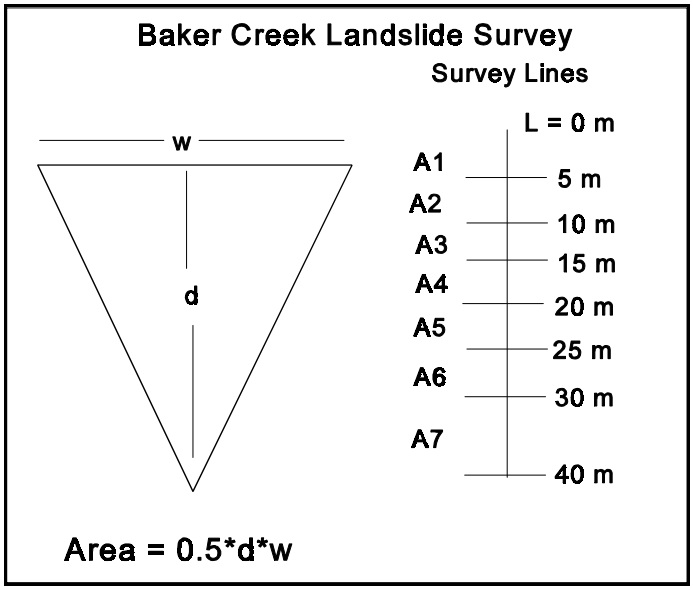
The class measured the geometry of a landslide scar at Baker Creek, near Sulpher Springs. The scar shape is approximated by that of an upside down equilateral triangle. The geometric relations and a sketch map of the field measurements is shown below.



w = scar width (m), d = scar depth (m), L = slope length (m)

Baker Creek Landslide Data

Survey Line No.	Scar Width (m)	Scar Depth (m)	Slope Distance (m)	Unit Slope Length (m)	Unit Scar Area (m^2)	Unit Scar Volume (m^3)
0	N/D	N/D	0			
1	6.25	2.5	5	L1 = ____	A1 = ____	V1=____
2	11.5	3.2	10	L2 = ____	A2 = ____	V2=____
3	15	5.0	15	L3 = ____	A3 = ____	V3=____
4	14	5.3	20	L4 = ____	A4 = ____	V4=____
5	13	3.0	25	L5 = ____	A5 = ____	V5=____
6	13	1.8	30	L6 = ____	A6 = ____	V6=____
7	13	1.8	40	L7 = ____	A7 = ____	V7=____

Total Scar Volume (m^3)= _____

Fill in the Table; follow the procedures below.

Step 1. Calculate the unit length for each survey line (e.g. L1 = slope distance1 - slope distance0).

Step 2. Calculate the unit scar area for each survey line (area of triangle = 0.5*d*w)

Step 3. Calculate the unit scar volume for each survey line (unit L * unit Area)

Step 4. Sum the unit area volumes to determine the total landslide volume.

Work through the following problems:

1. Assume that a small Coast Range watershed has a drainage area of 10.2 km^2, and a small-scale landslide density of 50 / km^2 (Assume that all landslides are of a scale exactly like the Baker Creek example above). Considering a recurrence interval of 2000 years for each landslide, calculate the following parameters:

A. The total number of landslides that will occur in the watershed in 2000 years.

B. The total volume of landslide transport over a period of 2000 years.

C. The total volume of landslide transport over a period of 100,000 years.

2. Given the basin area (km^2) and total volume transported over 100,000 years (m^3, from 1C above), calculate the average vertical thickness of regolith that is denuded by landslide processes during that period of time. Answer in meters.

3. Calculate the rate of vertical regolith denudation in mm/1000 yrs.

4. Given that the ratio of bulk density of bedrock:regolith is 0.6, calculate the average rate of vertical bedrock denudation from answer 3 above. Answer in mm/1000 yrs. Answer in m/M.Y.